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Improving the efficiency of grant and journal peer review: Registered Reports funding

Peer review – the process whereby scientific research is evaluated by independent experts within the field – remains a cornerstone of scientific research, and acts as a critical gatekeeper in relation to both grant funding and publication [1]. However, as the scientific community grows and the number of journals proliferates, the burden of peer review has grown considerably. At the same time, the ongoing debate around reproducibility and waste in research has identified non-publication of "unexciting" (i.e., null) results and the incentive structures that promote the publication of novel, eye-catching findings that convey a clean narrative, as major contributors to the poor reproducibility of much biomedical research [2]. In recent years, *Nicotine & Tobacco Research* has introduced a number of innovations intended to improve the quality and robustness of the work we publish [3,4], and has also adopted the Transparency and Openness in Reporting guidelines [5].

One proposed solution intended to improve the quality of published research is the Registered Reports model [6], which was created in 2013 and to date has been adopted by 50 journals (see https://cos.io/rr/). In contrast to conventional research articles, publishing decisions for Registered Reports are based on the importance of the research question and the methods proposed to answer that question. Critically, this decision is made before data collection has begun. This has the important advantage of reducing opportunity and incentives for biased research practices (e.g., leveraging analytical flexibility to achieve statistical "significance"), raising standards of methodological disclosure and statistical power, and avoiding publication bias (by offering in principle acceptance before the results are known). *Nicotine & Tobacco Research* recently announced that it would accept Registered Report submissions, with a particular focus on attempts to replicate important findings in the field [7].

However, we are also keen to explore other innovations in how science is conducted that may improve the efficiency and quality of scientific research. To this end, with Cancer Research UK – a large UK-based non-profit funder – we are piloting an extension of the Registered Reports model that integrates the model into the grant funding process. In this two-stage process, the funder first decides on whether or not to fund a project, based on a conventional grant application. An editor from *Nicotine & Tobacco Research* will be co-opted into this process, and grants recommended for funding will then passed on to us. In the second stage, the applicants submit a more detailed protocol for consideration as a Registered Report. The editor who was co-opted into the grant review process will oversee the review of the protocol, using the same reviewers who reviewed the grant. The advantage of this is that those reviewers will already be familiar with the material, and the incremental effort required will therefore be modest. Moreover, they will be able to be constructively critical at this stage in a way that is less likely in the current funding climate where any critical comment may be perceived as likely to undermine a grant that one would otherwise like to see funded.

Combining grant funding and publication decisions into a single, two-stage process promises to dramatically reduce the burden on reviewers, and also serve to reduce questionable research practices and publication bias. It therefore will benefit several stages of the research process (in particular publication and reporting, but also design and conduct). Working in partnership with Cancer Research UK's Tobacco Advisory Group to pilot this model, we hope to demonstrate that the model is feasible and acceptable to our community of researchers. We are confident that this process will reduce research waste considerably. Obviously the extent of this reduction will depend on the uptake of this model, and this may take several years. However, the

fact that we have secured one partnership willing to pilot the model is, in our opinion, an extremely important first step. We are confident that other partnerships will coalesce following this initial pilot.

Marcus Munafò

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